

Health Consultation

**Ridgefield Private Well Survey
(a/k/a Pacific Wood Treating Corporation)
Ridgefield, Clark County, Washington
EPA Facility ID: WAD009422411**

September 30, 2003

Prepared by

**The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry**



REWORD

The Washington State Department of Health (DOH) prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR, a part of the U.S. Department of Health and Human Services, is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines that ATSDR developed.

This health consultation is designed to identify and prevent harmful human health effects that result from exposure to hazardous substances in the environment. Health consultations focus on specific health issues so that DOH can respond to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates sampling data collected from hazardous waste sites, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health. The findings in this report are relevant to site conditions at the time of this health consultation and should be re-evaluated if site conditions or land use change in the future.

For additional information or questions regarding DOH or the contents of this health consultation, please call the health advisor who prepared this document:

Lenford O'Garro
Washington State Department of Health
Office of Environmental Health Assessments
P.O. Box 47846
Olympia, WA 98504-7846
(360) 236-3376
FAX (360) 236-3383
1-877-485-7316
Web site: www.doh.wa.gov/ehp/oehas/sashome.htm

For more information about ATSDR, contact the ATSDR Information Center at 1-888-422-8737 or visit the agency's Web site: www.atsdr.cdc.gov/.

GLOSSARY

Acute	Occurring over a short time (compare with chronic).
Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects that exposure to hazardous substances has on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation consisting of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Cancer Risk Evaluation Guide (CREG)	The concentration of a chemical in air, soil, or water that is expected to cause no more than one excess cancer case in a million persons exposed over a lifetime. The CREG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on the <i>cancer slope factor</i> .
Cancer Slope Factor (CSF)	A number assigned to a cancer-causing chemical that estimates its potential to cause cancer in humans.
Carcinogen	Any substance that causes cancer.
Chronic	Occurring over a long time (more than 1 year) (compare with acute).
Comparison value	Calculated concentration of a substance in air, water, food, or soil that is unlikely to cause harmful (adverse) health effects in exposed persons. The CV is used as a screening level during the public health assessment process. Substances found in amounts greater than their CVs might be selected for further evaluation in the public health assessment process.
Contaminant	A substance that is present either in an environment where it does not belong or at levels that might cause harmful (adverse) health effects.

Dose (for chemicals that are not radioactive)	The amount of a substance to which a person is exposed over a given time period. Dose is a measurement of exposure. Dose is often expressed as milligrams (amount) of a substance encountered or consumed per kilogram (a measure of body weight) per day (a measure of time). In general, the greater the dose, the greater the likelihood of an effect. An “exposure dose” is how much of a substance is encountered in the environment. An “absorbed dose” is the amount of a substance that actually got into the body through the eyes, skin, stomach, intestines, or lungs.
Environmental Media Evaluation Guide (EMEG)	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a <i>comparison value</i> used to select contaminants of potential health concern and is based on ATSDR’s <i>minimal risk level</i> (MRL).
Environmental Protection Agency (EPA)	The federal agency that develops and enforces environmental laws to protect the environment and the public's health.
Exposure	Contact with a substance through swallowing, breathing, or touching (skin or eyes). Exposure may be short-term (acute exposure), of intermediate duration, or long-term (chronic exposure).
Groundwater	Water beneath the earth’s surface in the spaces between soil particles and between rock surfaces (compare with surface water).
Ingestion	The act of absorbing something by eating, drinking, or mouthing. A hazardous substance can enter the body this way (see route of exposure).
Ingestion rate	The amount of an environmental medium that could typically be ingested on a daily basis. Units for IR are usually liters/day for water and milligrams/day for soil.
Lowest Observed Adverse Effect Level (LOAEL)	The lowest tested dose of a substance that has been reported to cause harmful (adverse) health effects in persons or animals.
Maximum Contaminant Level (MCL)	A drinking water regulation established by the federal Safe Drinking Water Act. It is the maximum permissible concentration of a contaminant in water that can be delivered to the free flowing outlet of the ultimate user of a public water system. MCLs are enforceable standards.

Minimal Risk Level (MRL)	An ATSDR estimate of daily human exposure to a hazardous substance at or below which that substance is unlikely to pose a measurable risk of harmful (adverse), noncancerous effects. MRLs are calculated for a route of exposure (inhalation or oral) over a specified time period (acute, intermediate, or chronic). MRLs should not be used as predictors of harmful (adverse) health effects (see reference dose).
Monitoring wells	Special wells drilled at locations on or off a hazardous waste site so that water can be sampled at selected depths and studied to determine the movement of groundwater and the amount, distribution, and type of contaminant.
No apparent public health hazard	A category used in ATSDR's public health assessments for sites at which human exposure to contaminated media might be occurring, might have occurred in the past, or might occur in the future, but at which the exposure is not expected to cause any harmful health effects.
No Observed Adverse Effect Level (NOAEL)	The highest tested dose of a substance that has been reported to have no harmful (adverse) health effects on persons or animals.
No public health hazard	A category used in ATSDR's public health assessment documents for sites at which persons have never and will never come into contact with harmful amounts of site-related substances.
Oral Reference Dose (RfD)	An amount of chemical ingested into the body (i.e., dose) below which health effects are not expected to occur. EPA publishes RfDs.
Parts per billion (ppb)/Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of trichloroethylene (TCE) in 1 million ounces of water is 1 ppm. 1 ounce of TCE in 1 billion ounces of water is 1 ppb. If one drop of TCE is mixed in a competition-size swimming pool, the water will contain about 1 ppb of TCE.
Plume	The volume of a substance that moves from its source to places away from the source. Plumes can be described by the volume of air or water they occupy and the direction they move. For example, a plume can be a column of smoke from a chimney or a substance moving with groundwater.
Remedial investigation	The CERCLA process for determining the type and extent of hazardous material contamination at a site.
Route of exposure	The way persons come into contact with hazardous substances. Three routes of exposure are breathing [inhalation], eating or drinking [ingestion], and contact with the skin [dermal contact].

BACKGROUND AND STATEMENT OF ISSUES

The Washington State Department of Health (DOH) conducted a survey to identify existing private wells near the former Pacific Wood Treating Corporation (PWT) site located in the City of Ridgefield, Clark County, Washington. This health consultation summarizes the procedure and results of the well survey and evaluates the past worst-case scenario of contamination in the City's water supply to determine if health effects would occur. DOH prepares health consultations under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

The former PWT facility, on about 41 acres, is located at 111 West Division Street, Ridgefield Washington. Burlington Northern Railroad is on the east border of the site, and Ridgefield Marina is on the south. Lake River, a side channel of the Columbia River, forms the west border, and Carty Lake and Ridgefield National Wildlife Refuge are on the north border. The facility operated from 1964 to 1993, pressure-treating specialty wood products with pentachlorophenol (PCP), creosote and copper/chromium/arsenic (CCA) solutions. Several site and facility investigations conducted over the years have shown groundwater contamination on and off the site.^{1, 2, 3, 4} Pentachlorophenol (PCP) (0.31- 4.0 micrograms per liter [$\mu\text{g/L}$]) and naphthalene ($1\mu\text{g/L}$), a polycyclic aromatic hydrocarbon (PAH), were detected in City water-supply wells in the 1980s. Subsequently, these wells were abandoned as drinking-water sources and were replaced with new wells about one-half mile upgradient.⁴

Several monitoring wells have been installed in and around the PWT site. The plume of contaminated groundwater in the shallow aquifer has moved north towards Carty Lake and Ridgefield National Wildlife Refuge. Maximum levels of $16\mu\text{g/L}$ PCP and $9.4\mu\text{g/L}$ trichloroethylene (TCE) have been found in off-site groundwater wells near Carty Lake and Ridgefield National Wildlife Refuge.^{3, 5} A steam-injection and extraction system was installed in 2002 to remove contaminants from groundwater at the PWT site.^{5, 6, 7}

DISCUSSION

Discussions with the Washington State Department of Ecology and the Southwest Washington Health District indicated that no drinking-water wells are located near the PWT site. However, DOH did not locate any record of the well survey done for the area. This survey was conducted to identify any wells that might be exposure points for contaminants in groundwater originating at PWT.

The survey area was defined using Arcview® geographic information system (GIS) software by drawing a 500-foot radius around the PWT site. The resulting map was provided to the Clark County Department of Assessment and Geographical Information System (GIS) to obtain a list of tax parcel numbers and the names and addresses of property owners within the area to be surveyed. All property owners in the survey area were sent letters and forms (Appendix A) to submit well-construction information. The basic intent of the survey was to confirm the lack of private drinking-water wells in the area near PWT and to evaluate past, worst-case human exposure that resulted from contamination of the City's water supply.

Table 1 shows that responses were received from 36% of those surveyed. All respondents said they were either on a municipal water system or had no well or water source. It is therefore unlikely that exposure to PCP contamination in drinking water is occurring.

Table 1. Survey of private wells near the former Pacific Wood Treating facility, Ridgefield, Washington, 2003.

	No. of property owners	% of effective sample
Survey sample	56	NA
Non-respondents	33	59
Respondents	20	36
Returned mail, no forwarding address	3	5

NA - Not applicable

Past Exposure to Naphthalene and Pentachlorophenol

Naphthalene and PCP data from drinking water wells were screened using ATSDR and U.S. Environmental Protection Agency (EPA) health-based criteria (comparison values). Contaminant concentrations below comparison values are unlikely to pose health threats and were not evaluated further in this health consultation. Contaminant concentrations exceeding comparison values do not necessarily pose health threats but were evaluated further to determine whether they are at levels that could result in adverse human health effects.

See Table 2, naphthalene and PCP were the only chemicals detected in the City's drinking water. Because naphthalene concentrations did not exceed its health comparison value and, as a result, do not pose public health hazards, no further evaluation for naphthalene was conducted.

No current exposure to PCP in drinking water exists. After PCP was detected in a composite sample at $4\mu\text{g/L}$ in November 1986, the well field remained in service until 1987 then was discontinued for use as public wells. Past exposure is difficult to assess because of the limited data available. In a single composite sample of the public drinking-water supply, PCP exceeded its cancer and noncancer health comparison values (Table 2). Because of the limited data, DOH is unable to determine whether concentrations of PCP or naphthalene were higher in the past. Potential noncancer and cancer effects estimated from past exposure to PCP in drinking water are evaluated below.

Table 2. Analytic result of a drinking water composite sample (µg/l) taken in 1986 from public water-supply wells, Ridgefield, Clark County, Washington.

Contaminant	Maximum concentration	Comparison value	EPA cancer class	Comparison value reference
Naphthalene	1	100	D	LTHA
Pentachlorophenol	4	0.2	B2	CREG

LTHA - EPA's Lifetime Health Advisory for drinking water

CREG - ATSDR's Cancer Risk Evaluation Guide

Noncancer effects

To evaluate possible noncancer effects from past exposure to PCP in drinking water, an exposure dose was calculated and then compared with a minimal risk level (MRL) and oral reference dose (RfD). RfDs and MRLs are doses below which noncancer adverse health effects are not expected to occur.

A level of uncertainty exists when defining an MRL or RfD because of uncertainty about the quality of data on which it is based. To account for this uncertainty, "safety factors" are used to set RfDs and MRLs below actual toxic effect levels (e.g., Lowest Observed Adverse Effect Level [LOAEL]). This approach provides an added measure of protection against the potential for adverse health effects to occur. For chronic oral exposure to PCP, the MRL is 0.001 milligrams/kilogram/day (mg/kg/day). Animal studies have shown that oral exposure to PCP can have adverse effects on the liver and kidney and on the nervous, endocrine, immune, and reproductive systems.⁸

Exposure dose calculations for PCP comparison values are provided in Appendix B. The maximum concentration of 4 µg/L PCP in the City's drinking-water wells in 1986 exceeds both the health comparison value of 0.2 µg/L and the MCL of 1 µg/L. These wells were then abandoned in 1987 as drinking-water wells. The estimated dose for children drinking an average of 0.9 liter of water per day at this level would be equal to 4 µg/day or 0.004 mg/day consumed. Because a child weighs an average of 15 kg, the child would receive an exposure dose of 0.0002 mg/kg/day, which is less than the RfD of 0.03mg/kg/day. Adults drink an average of 1.4 liters per day and weigh about 72 kg; therefore they would be exposed to approximately 0.00007 mg/kg/day, which is also less than the RfD. The maximum level of PCP found in the wells is not expected to result in any noncancer health effects.

Cancer effects

EPA classifies PCP as a Group B2 probable human carcinogen, using inadequate human but sufficient animal studies. The maximum concentration of PCP in drinking water of 4 µg/L is 20 times above the Cancer Risk Evaluation Guide (CREG) of 0.2 µg/L. PWT came into existence in 1964, and the wells were abandoned in 1987. Assuming that the contamination affected the well

immediately, a dose was calculated for a child growing to adulthood over 23 years (Appendix B). The theoretical excess cancer risk for such a person is estimated at about 4 in 1,000,000, a very low cancer risk. In this worst-case scenario, the levels of PCP in the City's drinking water would not be expected to result in adverse health effects.

CHILD HEALTH CONSIDERATIONS

The unique vulnerabilities of infants and children demand special attention in communities that have contamination of their water, food, soil, or air. The potential for exposure and subsequent adverse health effects is often increased for younger children compared with older children or adults. At this site, the estimated risks for children were a little higher than for adults but the risks were still very low. ATSDR and DOH recognize that children are susceptible to developmental toxicity that can occur at levels much lower than those causing other types of toxicity. The levels of exposure to both naphthalene and PCP in drinking water at this site were far below doses given to animals that showed no reproductive effects. Past exposure to the maximum level of PCP detected in the now-abandoned public supply wells shows only a slight increase in cancer risk for a person assumed to be exposed from birth through 23 years of age. This exposure duration is an overestimate because the site began operation in 1964 and the wells were abandoned in 1987. In this worst-case scenario, the levels of naphthalene and PCP in the City's drinking water would not be expected to result in adverse health effects for children.

CONCLUSIONS

1. No drinking-water wells were identified in the survey. Although the response rate was only 36%, the survey provides some reassurance that no drinking-water wells are located near the PWT site.
2. The limited data available indicate that past exposure to the maximum concentration of PCP in the City's drinking water (4 µg/L) is characterized as a *no apparent public health hazard*.
3. No public health hazard currently exists in the City's drinking-water supply because new wells were installed in 1987.

RECOMMENDATIONS/ACTION PLAN

1. No drinking-water wells should be drilled in the contaminated area or immediately downgradient of the site. Future human exposure pathways would be of concern if wells were drilled in this area for drinking water.
2. DOH recommends a follow-up, door-to-door survey because response to the original survey was low.
 - DOH will do a door-to-door survey

PREPARER OF REPORT

Lenford O'Garro
Washington State Department of Health
Office of Environmental Health Assessments
Site Assessment Section

DESIGNATED REVIEWER

Robert Duff, Manager
Site Assessment Section
Office of Environmental Health Assessments
Washington State Department of Health

ATSDR TECHNICAL PROJECT OFFICER

Debra Gable
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

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APPENDIX A

Letter and Well Survey

February 10, 2003

Dear Resident:

The Washington State Department of Health is requesting information on drinking water wells in your area. We need this information to ensure that groundwater contaminants at the former Pacific Wood Treating site are not threatening nearby drinking water wells. While it is unlikely that these contaminants would move in your direction, we want to know what wells might be in the area. We would then determine if sampling and analysis for these contaminants is necessary to ensure that your drinking water is safe.

This information will not be used for any other purpose and will be available to the public only by formal request. Your participation in this survey is voluntary. You will not lose any services or benefits if you choose not to participate. If you do use a private well, your participation will allow us to assess the need for sampling and, if necessary, evaluate sample results.

Please take a few minutes and fill out the enclosed form and return it to us according to the instructions given on the form. We ask that you fill it out regardless of your water source so that we know you have received this request.

If you have any questions, please do not hesitate to call me toll-free at 1-877-485-7316 or (360) 236-3376. Your cooperation is appreciated.

Sincerely,

Robert Duff
Manager
Site Assessment Section

Enclosure (Survey)

Ridgefield Neighborhood Water Well Survey

To help us identify all water wells in your area, please fill out this form as completely as possible.

1. Your name:

2. Your address:

(Please make address corrections directly on this form)

3. Your telephone number: _____

What are the best times to call you?: _____

4. What is your source of tap water? (**check only one**)

____ Municipal (city) water system

____ Small community (neighborhood)
water system

Water system name:

Operator's name:

Operator's phone #:

____ Private well (serving 1 or 2 houses)

____ Don't know

If you use a private well, please indicate:

Name of well owner: _____ Phone #: _____
(if someone else)

Location of the well (for example, "100 feet behind my house", or "behind the house at 2011 Oak Rd.")

Well depth: _____ Year drilled: _____

Thank you for your help. We will contact you if we think that your well should be tested.

APPENDIX B

Exposure Calculations

Water Ingestion Route of Exposure - Noncancer

Variables:

Ingested Dose (ID)

Water Concentration (C_w)

Ingestion Rate (IR)

Exposure Frequency (EF)

Exposure Duration (ED)

Body Weight (BW)

Averaging Time (AT)

$$ID = \frac{C_w * IR * EF * ED}{BW * AT}$$

Pentachlorophenol: RfD = 0.03 mg/kg-day

Child drinking 0.9 liter of water per day

C_w = 0.004 l/day

IR = 0.9mg/l

EF = 350days

ED = 5 yrs

BW = 15 kg

AT = 1825 days

$$ID = \frac{0.004 * 0.9 * 350 * 5}{15 * 1825}$$

$$ID = 0.0002 \text{ mg/kg/day}$$

Adult drinking 1.4 liter of water per day

C_w = 0.004 mg/l

IR = 1.4 l/day

EF = 350days

ED = 23 yrs

BW = 72 kg

AT = 8395 days

$$ID = \frac{0.004 * 1.4 * 350 * 23}{72 * 8395}$$

$$ID = 0.00007 \text{ mg/kg/day}$$

Water Ingestion Route of Exposure - Cancer

Variables:

Ingested Dose (ID)

Water Concentration (Cw)

Ingestion Rate (IR)

Exposure Frequency (EF)

Exposure Duration (ED)

Body Weight (BW)

Averaging Time_{cancer} (AT)

Oral Cancer Slope Factor (CSF)

$$ID = \frac{Cw * IR * EF * ED * CSF}{BW * AT}$$

Pentachlorophenol: RfD = 0.03 mg/kg-day

Child drinking 0.9 liter of water per day

Cw = 0.004 l/day

IR = 0.9mg/l

EF = 350days

ED = 5 yrs

BW = 15 kg

AT = 27375 days

$$ID = \frac{0.004 * 0.9 * 350 * 5 * 0.12}{15 * 27375}$$

$$ID = 0.000002 \text{ mg/kg/day}$$

Adult drinking 1.4 liter of water per day

Cw = 0.004 mg/l

IR = 1.4 l/day

EF = 350days

ED = 8 yrs

BW = 72 kg

AT = 27375 days

$$ID = \frac{0.004 * 1.4 * 350 * 8 * 0.12}{72 * 27375}$$

$$ID = 0.000001 \text{ mg/kg/day}$$

CERTIFICATION

This Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Debra Gable
Technical Project Officer,
SPS, SSAB, DHAC
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Roberta Erlwein
Section Chief,
SPS, SSAB, DHAC
ATSDR